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FORM TP 2011103

MAY/JUNE 2011

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

PHYSICS

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of **SIX** questions.
2. Section A consists of **THREE** questions. Candidates must attempt **ALL** questions in this section. Answers for this section must be written in this answer booklet.
3. Section B consists of **THREE** questions. Candidates must attempt **ALL** questions in this section. Answers for this section must be written in this answer booklet.
4. All working **MUST** be **CLEARLY** shown.
5. The use of non-programmable calculators is permitted, but candidates should note that the use of an inappropriate number of figures in answers will be penalised.
6. Mathematical tables are provided.

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SECTION A

Attempt ALL questions.

You MUST write your answers in this answer booklet.

1. A taxi driver was taking his friends to a popular 20/20 cricket match. Table 1 shows the vehicle's velocity for the first minute of the journey.

TABLE 1

Velocity, V/ms^{-1}	Time, t / s
0.0	0.0
11.0	10.0
23.0	20.0
34 .0	30.0
47.0	40.0
57.0	50.0
69.0	60.0

(a) Plot on page 3, a graph of velocity (V) versus time (t). **(7 marks)**

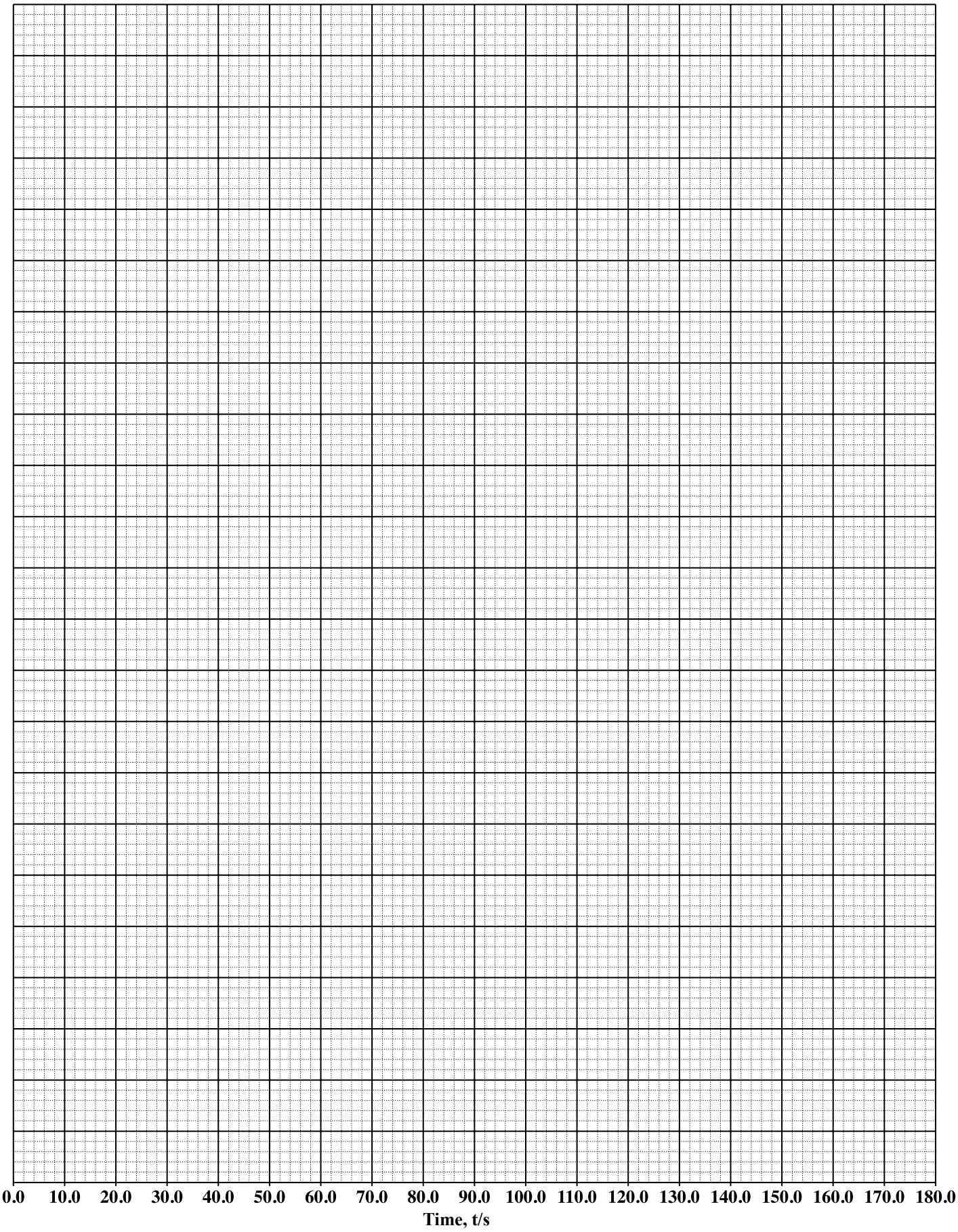
(b) From the graph, calculate the slope, p.

(4 marks)

(c) What quantity does the slope, p, represent?

_____

(1 mark)


0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
110.0
120.0
130.0
140.0
150.0
160.0
170.0
180.0
Time, t/s

(d) For the next minute, the vehicle's velocity was constant, then for the final minute, the vehicle decelerated uniformly to a stop on reaching the stadium.

(i) Continue the velocity-time graph on page 3, to show this information and use the graph to determine the total distance travelled.

(4 marks)

(ii) Calculate the average velocity of the taxi for the **complete** journey.

(2 marks)

(iii) If the total mass of the loaded taxi was 1 500 kg, determine the momentum of the vehicle when it is travelling at constant velocity.

(3 marks)

(e) (i) Define the term ‘displacement’.

_____

_____

(2 marks)

(ii) Complete Table 2 by ticking (√) the appropriate column that represents the quantity, given in the table.

TABLE 2

Quantity	Scalar	Vector
Displacement		
Acceleration		

(2 marks)

Total 25 marks

2. (a) (i) Complete Table 3 by inserting the correct symbol and SI Unit which relate to the quantity shown in Column 1.

TABLE 3

Quantity	Symbol	SI Unit
Specific Heat Capacity	c	_____
Specific Latent Heat of Vaporization	_____	_____

(3 marks)

(ii) Define the term 'heat capacity of a substance'.

_____

_____

(2 marks)

(iii) Write the equation that relates specific heat capacity with heat capacity.

_____

(1 mark)

(b) A busy housewife left 25 g of ice in an open insulated container while she was answering her cellphone. When she returned, the ice at 0 ºC was converted to water at 3.0 ºC.

(i) Calculate the energy needed for the ice to totally melt and to reach its present temperature. Assume no heat losses.

[Specific Heat Capacity of water = 4 200 J $Kg^{-1}K^{-1}$
Specific Latent Heat of Fusion of Ice = 340 000 J Kg^{-1}]

(6 marks)

(ii) If this melting and heating activity took place over 300 s, calculate the rate at which the ice / water was receiving heat.

(3 marks)

Total 15 marks

3. Figure 1 shows a simple cell connected to a circuit.

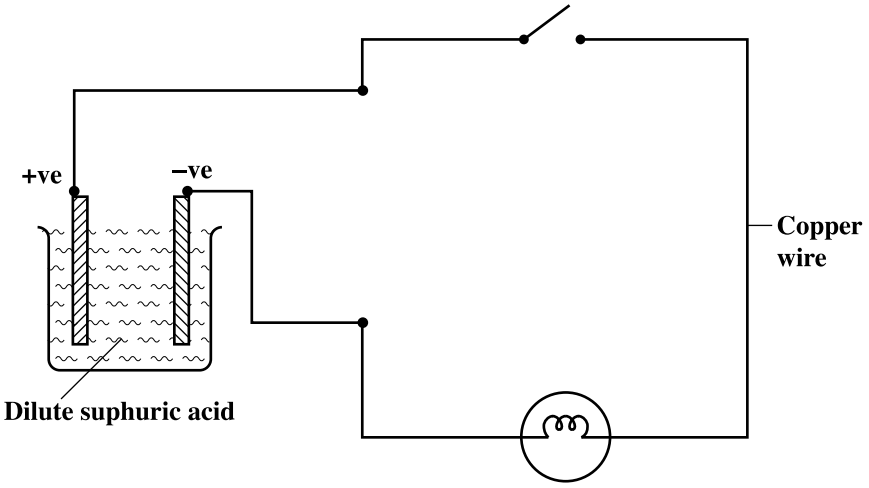


Figure 1

(a) (i) How does the flow of the current within the simple cell differ from that in a copper wire?

_____

_____

_____

(2 marks)

(ii) Name the material used for the positive terminal in a dry cell.

_____

(1 mark)

(iii) Name the material used for the negative terminal in a dry cell.

_____

(1 mark)

(iv) In the circuit in Figure 1, if the current is steady at 0.1 A, calculate the charge that goes through the copper wire in 60 s.

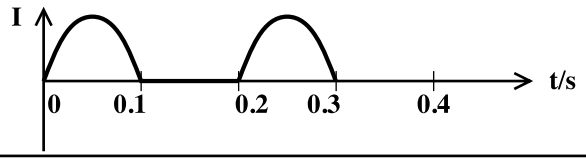
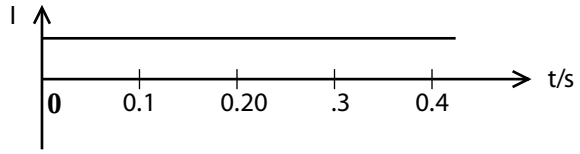
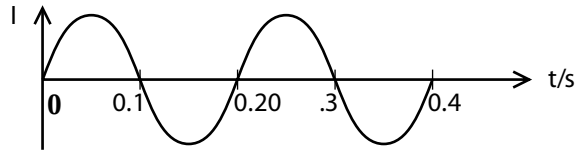
(3 marks)

(v) Determine how much charge goes through the simple cell in 60 s.

(1 mark)

(b) (i) Identify the type of current (d.c. or a.c.) which generated the specific waveforms A, B and C shown in Table 4.

TABLE 4

	Waveform	Type of Current
A		
B		
C		

(3 marks)

(ii) Determine the period **and** frequency for Waveform C.

(4 marks)

Total 15 marks

SECTION B

Attempt ALL questions.

You MUST write your answers in the space provided after each question.

4. (a) Eron, a form five Physics student, has available to him a bright filament light in a ray box, an opaque screen with two closely spaced narrow slits, and a large white screen.

Describe how he can set up the apparatus to be able to observe an interference pattern of light and dark bands on the white screen **and** briefly explain why this pattern forms. **(6 marks)**

(b) Figure 2 shows a narrow beam of white light which is shone onto a triangular prism at an angle of incidence of 30°.

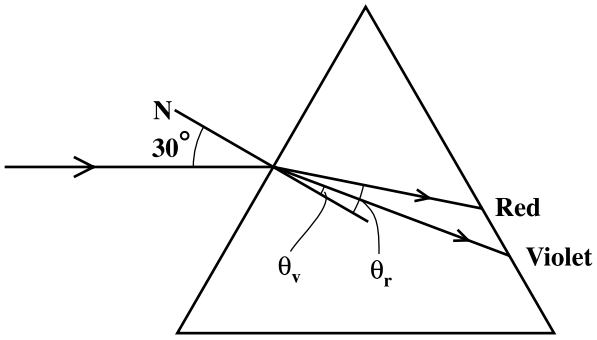


Figure 2

(i) If the angle of refraction for the violet light, θ_v, is 20°, what is the refractive index of this prism for violet light? **(3 marks)**

(ii) Calculate the speed of the violet light in the prism. **(3 marks)**

(iii) Calculate the frequency of violet light if the wavelength in air is 430 nm.

[1 nm = 10^{-9} m
Velocity of light in air = 3.0×10^8 m s^{-1}] **(3 marks)**

Total 15 marks

Write your answer to Question 4 here.

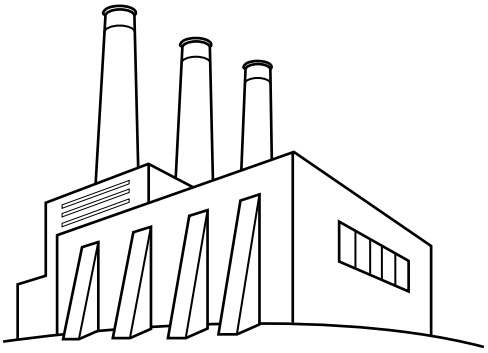
Write your answer to Question 4 here.

5. Many modern electrical appliances have been designed to operate with a.c. power rather than d.c. power because electrical power is transmitted as a.c. rather than d.c.

(a) (i) State TWO advantages of using a.c. to transmit electrical power. **(2 marks)**

(ii) Draw a diagram of a simple transformer indicating the features which enhance efficiency. **(4 marks)**

(b)



Electrical power produced by Powergen in Trinidad is stepped up from 11 000 V at 8 000 A to 110 000 V for transmission to Tobago.

(i) If the number of turns in the secondary coil is 900, calculate the number of turns in the primary coil for an ideal transformer. **(3 marks)**

(ii) Calculate the transmission current for the ideal transformer referred to at (b) (i). **(3 marks)**

(iii) Calculate the transmission power if the transformer is 70% efficient. **(3 marks)**

Total 15 marks

Write your answer to Question 5 here.

Write your answer to Question 5 here.

6. (a) (i) Outline THREE uses of radioisotopes in medicine. **(3 marks)**

(ii) State THREE safety precautions to be taken when using radioactive substances. **(3 marks)**

(b) (i) A gram of living plant material with Carbon –14, decays at a rate of about 16 disintegrations per minute. When the plant dies, the Carbon –14 decays, with a half-life of 5 600 years. A gram of the dead plant is found to decay at about 1 disintegration per minute. Calculate the probable age of the plant. **(4 marks)**

(ii) The mass of the sun is lost at the rate of 2.0×10^9 kg s^{-1}. If the speed of light in a vacuum is 3.0×10^8 m s^{-1}, calculate the power output of the sun in kilowatts. **(5 marks)**

Total 15 marks

Write your answer to Question 6 here.

Write your answer to Question 6 here.

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